

WHAT IS CLAIMED IS:

1. A processing method that uses process gas plasma that contains at least hydrogen to terminate
5 dangling bonds in an object that at least partially contains a silicon system material, said processing method comprising the steps of:

placing the object on a susceptor in a process chamber that includes a dielectric window and
10 the susceptor, and controlling a temperature of the susceptor to a predetermined temperature;

controlling a pressure in the process chamber to a predetermined pressure;

introducing the process gas into the process
15 chamber; and

introducing, via the dielectric window, microwaves for a plasma treatment to the object into the process chamber so that plasma of the process gas has plasma density of 10^{11} cm⁻³ or greater, wherein a
20 distance between the dielectric window and the object is maintained between 20 mm and 200 mm.

2. A processing method according to claim 1, wherein the plasma treatment requires no bias
25 application.

3. A processing method according to claim 1,
wherein said step of introducing the microwaves
previously regulates an output of a microwave generator
that supplies the microwaves, so as to obtain the
5 plasma density.

4. A processing method according to claim 1,
wherein the distance is between 50 mm and 150 mm.

10 5. A processing method according to claim 1,
wherein the predetermined temperature is between 200 °C
and 400 °C.

6. A processing method according to claim 1,
15 wherein the predetermined pressure is between 13 Pa and
665 Pa.

7. A processing method according to claim 1,
wherein said step of controlling the pressure includes
20 the steps of:

igniting plasma under a pressure higher than
the predetermined pressure; and

changing the pressure to the predetermined
pressure after said igniting step.

25

8. A processing method according to claim 1,
wherein the dielectric window has a thermal

conductivity of $70 \text{ W} / \text{m} \cdot \text{K}$ or greater.

9. A processing method according to claim 1,
wherein said step of introducing the microwaves uses an
5 antenna that has one or more slots to introduce the
microwaves into the dielectric window.

10. A processing method according to claim 1,
wherein the process gas includes inert gas at least at
10 the time of plasma ignition.

11. A processing apparatus that provides a plasma
treatment to and terminates dangling bonds in an object
that at least partially contains a silicon system
15 material, said processing apparatus comprising:

a process chamber, connected to a microwave
generator for supplying microwaves, which includes a
dielectric window that allows the microwave from the
microwave generator to be introduced into said process
20 chamber, and a susceptor that supports the object;

an introducing part for introducing process
gas that contains at least hydrogen gas into the
process chamber;

a measurement part for measuring a plasma
25 discharge state of plasma of the process gas; and
a controller for comparing a measurement
result by said measurement part with a reference value

to maintain plasma density to be 10^{11} cm^{-3} or greater,
and for giving an alarm as abnormal discharge when
determining that the plasma density becomes below 10^{11}
 cm^{-3} , wherein a distance between the dielectric window
5 and the object is maintained between 20 mm and 200 mm.